

REMARKS

Claims 100-119 are pending. Claims 109-119 have been withdrawn. Claim 106 stands objected to and rejected under 35 U.S.C. § 112, second paragraph. Claims 100-108 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Kirschock et al., *Angew. Chem. Int. Ed.* 40: 2637-2640 (2001) ("Kirschhock").

Claim Objection

The Examiner has objected to claim 106 as being of improper dependent . Claim 106 has been canceled, and this objection is therefore moot.

Rejection under 35 U.S.C. § 112, second paragraph

The Examiner has rejected claim 106 under 35 U.S.C. § 112, second paragraph, as being indefinite. Claim 106 has been canceled and new claim 120, which finds support in original claim 106, has been added. Claim 120 depends from claim 108, which is directed to the tetrapropylammonium-ion and the cationic surfactant or triblock copolymer. This rejection may therefore be withdrawn.

Rejection under 35 U.S.C. § 102(b)

The Examiner has rejected claims 100-108 under 35 U.S.C. § 102(b) as being anticipated by Kirshhock. For the following reasons, applicants respectfully traverse this rejection.

Claim 100 reads:

100. (Previously presented) A crystalline mesoporous silica material being obtained by assembly of nanometer size building units having zeolite framework, said crystalline mesoporous silica material having two or more levels of porosity and structural order, and wherein the internal structure of said nanometer size building units does not give rise to Bragg type diffraction in a powder X-ray diffraction pattern of said crystalline mesoporous silica material.

Kirschhock reports that zeosil silcalite-1 with a silicon dioxide framework and MFI framework topology crystallizes by heating a clear solution prepared from tetraorthosilicate (TEOS), tetrapropylammonium hydroxide (TPAOH), and water.

Kirschhock also reports that transmission electron microscopy (TEM) and small-angle X-ray scattering (SAXS) studies revealed the quantitative formation of rectangular, nanometer-sized slabs from silica sources by the reaction with an aqueous solution of TPAOH. The TPA is occluded inside the nanoslabs, and propyl chains protrude to the outside. Kirschhock explains this at the end of the first paragraph of their publication "... nanoslab surfaces are provided with alkyl pins and silicate framework holes"). This pin and hole system provides for the compact clicking together of the nanoslabs. This coalescence of individual slabs into a larger particle is the key step in the formation of a zeolite. This is explained on p.2639, first line of the left column ("This supports the view that the formation and self-organization of nanoslabs are key steps in TPA-ion-mediated MFI synthesis"). MFI is the framework type code for a zeolite (*Atlas of zeolite structure types*, 5th revised ed., Ch.Baerlocher, W.M. Meier, D.H. Olson, Elsevier, Amsterdam, 2001; the atlas is maintained on the website of the International Zeolite Association: <http://www.iza-structure.org/databases/>).

A zeolite is a crystalline material displaying an X-ray diffraction pattern and has only one level of porosity. This porosity is caused by the formation of a network of bonded silicon and oxygen atoms with wide rings that have free openings that measure typically 1 nm or less. The rings line up and make channels and cages. Nanoslabs contain such very short channels. Figure 6 shows the linking of nanoslabs. In all the linkage variants shown in Figure 6 (linking through corners, edges and faces) the framework of one slab is continued in the slab connected to it. By doing so, the channels get longer, but no new type of pores is created. The clicking together of nanoslabs leads to the connection of the channel segments from the two units and formation of a larger channel out of the two short segments present in the original units. The channel diameter

remains the same. The porosity of the zeolite is that determined by the specific zeolite framework type. In this instance it is the “MFI” type. A zeolite represents the most compact manner of stacking nanoslabs. Kirschhock thus teaches how to make a compact stacking of nanoslabs. This compact stacking and coalescence leads to the formation of a zeolite crystal, which displays X-ray diffraction at small lattice spacings (d-values smaller than 1.5 nm). Therefore, it is an inherent property of zeolites, including those disclosed in Kirschhock, that they exhibit only one level of porosity and the inherent presence of two or more levels of porosity, as suggested by the Examiner, can be excluded.

The present specification teaches how to make materials with more open structures than those disclosed in Kirschhock, in which free spaces - several nanometers wide - are left between individual nanoslabs. In these new materials, the smallest pores are identical to those present inside the nanoslabs and inside the zeolite disclosed in Kirschhock. This is the first-level of porosity. By assembling the nanoslabs systematically and leaving void spaces between them, a well defined secondary porosity is created. Stacking patterns of higher order can even be imposed on a third level, and so on. Kirschhock fails to teach how to assemble nanoslabs such that systematically open spaces are left in between. The new materials disclosed in the present application exhibits X-ray diffraction peaks at larger d-values than the zeolite disclosed in Kirschhock owing to the systematic stacking of nanoslabs in an open manner rather than the coalescence of the nanoslabs into a continuous crystalline lattice characterized by small d-spacings.

Moreover, the presence of sodium ions and TPA in the synthesis mixture for preparing nanoslabs are sufficient for synthesizing a zeolite as disclosed in Kirschhock, but not for synthesis of the claimed new materials having more than one order of porosity. For creating the secondary porosity, surfactant or polymer molecules are needed. These molecules occupy the spaces between the nanoslabs. The surfactants and polymers are organic molecules that can be removed through calcination. Tetrapropylammonium and tetrabutylammonium ions used in the synthesis of the nanoslabs themselves, can not

assume the role of template for the creation of the secondary porosity. The surfactants for assembling the nanoslabs typically have a long alkyl chain, such as in cetyltrimethylammonium ions. Furthermore, TPA cannot be removed by filtration, as suggested by the Examiner, since TPA is occluded inside the nanoslabs, as shown in Figure 6 of Kirschhock, and cannot be removed physically.

Accordingly, because Kirschhock fails to teach claims 101-108, the section 102(b) rejection should be withdrawn.

Foreign Priority

Applicants request acknowledgement of the foreign priority claim, and confirmation that the certified copy of the priority document has been received by the Office.

CONCLUSION


Applicants submit that the claims are now in condition for allowance, and such action is requested.

Enclosed is a Petition to extend the period for replying to the Office action for one (2) months, to and including February 23, 2009 (as February 22, 2009 was a Sunday), and payment of the required extension fee.

If there are any additional charges or any credits, please apply them to Deposit Account No. 03-2095.

Respectfully submitted,

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